# Informal Education

NASA's ESE seeks to increase public scientific literacy of Earth system science and climate change by engaging the public in shaping and sharing the experience of exploration and discovery. NASA is doing this by:

- Providing engaging Earth system science content and human resource support to informal learning institutions for the benefit of all learners; and
- Cultivating citizens' abilities to get the data, resources and information they need to satisfy their own curiosity about how the Earth system works and/or take actions to meet individual or societal needs.

Informal learning opportunities arise in many venues, including museums, science and nature centers, public lands management groups and agencies, community and youth groups, and the mass media. NASA Earth system science informal education efforts are building and maintaining relationships with informal educators, with a focus on providing content and expertise for these professionals. The program also develops and distributes a rich variety of Earth system science education resources and materials that can be used by informal educators and audiences—these are listed in the "Products & Resources" section of the current catalog. This section describes informal education projects and activities that are supported by NASA's ESE.

## The Dynamic Earth

*http://www.discoverycube.org*

Located in Santa Ana, California, Discovery Science Center is a nonprofit organization dedicated to educating young minds, assisting teachers and increasing public understanding of science, math and technology through interactive exhibits and programs. The center's Dynamic Earth program includes:

- A curriculum packet containing lesson plans on several topics, such as earthquakes, atmospheric sciences and water quality monitoring;
- A program for training teachers in the use of the lesson plans—the six-hour training covers 2–3 weeks of classroom instruction; and
- An interactive science presentation featuring hands-on exhibits, including an earthquake simulation room, an eight-foot freestanding tornado, and a kalliroscope that models the fluid dynamics of the ocean and atmosphere.

Participants in Dynamic Earth investigate various topics, including plate tectonics and the changing patterns of land, sea and mountains on the Earth's surface; how the Sun's heating of the Earth's surface drives atmospheric and oceanic circulations, global weather patterns and geographical distribution of marine and terrestrial organisms; and how human impacts on the Earth's atmosphere and waterways affect all life on Earth.

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## Earth as Art

*http://landsat.gsfc.nasa.gov/earthasart*
*http://landsat7.usgs.gov/gallery/index.php*

Landsat satellites have been acquiring stunning images of the Earth's land surface and coastal regions since 1972. The program is jointly managed by NASA and the U.S. Geological Survey (USGS), and has provided a wealth of data and information for research and education on land use and land cover change over time.

The Library of Congress celebrated the 30th anniversary of the launch of the first Landsat satellite with an exhibit that showcased imagery from Landsat 7, the latest in the Landsat series. Images were selected purely on aesthetic, rather than scientific, value. You can view the images that were included in this exhibition at: *http://www.loc.gov/exhibits/earthasart/eaa-exhibit.html.*

Earth as Art is an online gallery that features images from the original exhibit, as well as more recent imagery from NASA's Landsat and Terra satellites. High-resolution versions of the images may be downloaded for free (please credit

images to "USGS/NASA"). Poster-size prints of selected images may be ordered at cost from the USGS at: http://landsat7.usgs.gov/gallery; click on "Earth as Art" at right, then click on any image. NASA's Goddard Space Flight Center also has a limited number of mounted and framed posters that can be borrowed and displayed in the context of an Earth system science education program.

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## Earth Observatory

*http://earthobservatory.nasa.gov*

NASA's Earth Observatory is an interactive Web-based magazine where the science-attentive public can obtain new satellite imagery and scientific information about our home planet. The focus is on Earth's climate and environmental change. The site is also designed to be useful to public media and educators. Any and all materials published on the Earth Observatory are freely available for re-publication, re-use or re-broadcast (except in rare cases where copyright is indicated).

Visit the Earth Observatory to read feature articles on wide-ranging Earth system science topics, download datasets and images for analysis, read breaking news, learn about current and planned Earth missions, search an online library for reference materials, track natural hazards around the world in near real time, and access interactive experiments and classroom activities.

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## Earth Science Enterprise Museum Support

The goal of this program is to understand how NASA's Earth science education program can best support the needs of informal educators, especially at museums, science centers, aquaria and zoos. The project started in 1999 when NASA's Jet Propulsion Laboratory (JPL) worked with the Denver Museum of Natural History and 11 other museums to develop and conduct a survey of informal education priorities in Earth science and interest in future programs. In 2000, development began on programs identified in the survey, including Earth science workshops and informal education partnerships.

The project continues to develop relationships with a broad spectrum of informal science education organizations across the country.

Activities include providing professional development on NASA Earth science content and resources to staff of science centers and museums, in partnership with professional organizations. In 2003, JPL piloted this program with the Association of Science-Technology Centers (ASTC) by presenting an ASTC RAP (Roundtable for the Advancement of the Professions) entitled "Making NASA's Earth Science Resources Work for You." The goal of the program is to create a community of museum professionals who are knowledgeable about NASA resources; the objective of the RAP was to bring current research and information resources to the participants.

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## E-Theater

*http://etheater.gsfc.nasa.gov*

Large-screen format digital theater presentations displaying new NASA Earth science data sets in high definition are available to technical and non-technical audiences. Presentations demonstrate new science results using the latest information technology tools in an interactive digital presentation. An increasing number of presentations are offered annually around the country and the world to audiences of the international science and technology community. At least three months' notice is preferred for scheduling.

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## Eyes on Earth

*http://www.omsi.edu/visit/earth/eyesonearth*

Eyes on Earth is a new, interactive science exhibition developed by the Oregon Museum of Science and Industry (OMSI) that focuses on NASA's Earth Observing System (EOS) and examines how satellite observations are made and what we can learn about the Earth using space technology. Designed primarily for families and school groups (upper elementary through adults), visitors learn what a satellite is, discover the different types of orbits and explore cutting-edge technology similar to that used by EOS scientists. Eyes on Earth brings these concepts "down to Earth" through a combination of fun, accessible interactives in a playful and "spacey" environment. The exhibit explores three major areas: Satellites, Orbits and Satellite Technology.

The exhibit is available for rental beginning Summer 2004. Contact the OMSI Traveling Exhibits program for pricing and availability.

**CONTACT:** OMSI Traveling Exhibits, 1945 SE Water Ave., Portland, OR 97214, **Phone:** 503-797-4659, **Email:** travelingexhibits@omsi.edu.

## Federation of Earth Science Information Partners

*http://www.esipfed.org*

The Federation of Earth Science Information Partners (ESIP) brings together government agencies, universities, nonprofit organizations and businesses in an effort to make Earth science information available to a broader community. NASA is a sponsoring agency of the ESIP Federation.

The objective of the Federation is to evolve methods that make Earth science data (satellite and ground-based) easy to preserve, locate, access and use for all beneficial applications, including research, education, commercial development, agriculture, land management, environmental monitoring, policy making and many other applications.

Visit the Federation Web site to learn about ESIP education services and products for elementary through college levels, informal education and professional development.

**CONTACT:** Dave Jones, President of the ESIP Federation, Columbia Corporate Park 100, 6021 University Blvd., Suite 140, Ellicott City, MD 21043, **Phone:** 410-203-1316, **Fax:** 410-203-9341, **Email:** dave@stormcenter.com.

## Forces of Change

*http://www.mnh.si.edu/exhibits/forces*

Forces of Change is a comprehensive program at the Smithsonian's National Museum of Natural History about the dynamics of global change. Funded by NASA and other donors, it explores the geological, environmental and historical processes that shape our world. In addition to producing exhibits for display at the museum, the Forces of Change team is developing traveling exhibits, classroom activities, publications, interactive computer programs, a Web site and other outreach materials.

The Forces of Change exhibition hall features case studies on the forces that have shaped and sustained Earth since the beginning of geologic time. Forces of Change exhibits combine traditional and high-tech approaches to learning about Earth systems and managing our precious natural resources. Currently on display in the Forces of Change Hall is the Global Links exhibit (see listing on the next page).

**CONTACT:** Barbara Stauffer, National Museum of Natural History, Office of Exhibits, 10th and Constitution, Washington, DC 20560-0101, **Phone:** 202-357-2377, **Fax:** 202-786-2567, **Email:** stauffer.barbara@nmnh.si.edu.

## Global Climate Change and You: Workshops for Girl Scout Leaders

*http://www.girlscouts.org*

Girl Scouts of the USA has teamed up with NASA in an effort to support new and existing local Girl Scout council and national science initiatives. "Global Climate Change and You" is a workshop series for Girl Scout leaders. Through field work and hands-on activities, leaders develop the skills and experience needed to confidently engage their troops in Earth system science.

This collaboration is designed to:

- Enhance Girl Scout programs geared toward increasing understanding of, and interest in, science among girls and adults;
- Build on existing Girl Scout science, math and technology curriculum through in-depth exploration of science topics; and
- Provide opportunities for girls to discover diverse career options.

Resources available to the councils include interactive science activities for science events, online access to science activities through the "Just 4 Girls" pages *(http://jfg.girlscouts.org),* Scout Interest Project Awards, event speakers (including women scientists), training workshops on Earth science topics, and participation in special events sponsored by NASA.

NASA's Langley Research Center designs and sponsors workshops especially for Girl Scout trainers. These workshops develop skills in Earth system science, climate change and atmospheric science. Workshop participants are able to return to their councils ready to train leaders to work with girls in the areas of Earth system science and global climate change. Workshops available by application; interested trainers can check with their local Girl Scout council for the latest information on upcoming workshops.

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## Global Links

*http://www.mnh.si.edu/exhibits/global_links*

NASA and the Smithsonian's National Museum of Natural History have collaborated to design an Earth system science exhibit called Global Links, as part of the museum's Forces of Change program (see listing on the previous page). The exhibit advances the public's understanding of Earth system science by combining NASA's expertise in space-based observations with the museum's renowned collections and experience in object-based science education. By relating museum specimens with remote-sensing visualizations, the exhibit capitalizes on the unique capability of space-based imagery to present a global perspective of the Earth, and the unique appeal of seeing and interacting with tangible evidence of the Earth's dynamics and history.

**CONTACT:** Barbara Stauffer, National Museum of Natural History, Office of Exhibits, 10th and Constitution, Washington, DC 20560-0101, **Phone:** 202-357-2377, **Fax:** 202-786-2567, **Email:** stauffer.barbara@nmnh.si.edu.

## Immersive Earth: Teaching Earth Science by Fulldome Experiences and Hands-On Exhibits

*http://earth.rice.edu*

Immersive Earth uses the unique capabilities of widescreen theaters to teach Earth science concepts. This project is an outgrowth of Museums Teaching Planet Earth, the first and only group to create Earth science content for the fulldome theater. Projection systems will be placed in cooperating museums to bring Earth science shows to rural regions and underserved communities. A desktop viewer will also be created so that individuals can view the shows on their personal computers. Anticipated shows are "Earth's Wild Ride," "Earth in Peril" and "Earth in the Balance."

An additional component of the program, the Global Links Portal Project, will adapt Earth system science exhibit units developed for the National Museum of Natural History and make them available to educators for classroom use. The units are designed to include several interactive computer components, allowing visitors to explore complex and dynamic material, including satellite imagery and visualizations. The exhibit content will be adapted and made available, along with the interactive components, on the Internet. Also, teacher guides and supplemental activities to go with the exhibits will be developed for classroom use. Units will include updatable NASA material and will be aligned with national education standards for science, math, geography and social studies.

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## Museums Teaching Planet Earth

*http://mtpe.com/mtpe/mtpe.html*

Museums Teaching Planet Earth (MuTPE) is an innovative program sponsored by the Federation of Earth Science Information Partnership (ESIP), a program of NASA's Earth Science Enterprise. MuTPE uses three independent mechanisms for educating the public about Earth science:

- **Earth Update—**An interactive educational computer program, Earth Update works as a stand-alone exhibit at a museum or school, or as a CD-ROM resource for personal use. Real-time data is displayed for five of the Earth's spheres—the atmosphere, biosphere, cryosphere, geosphere and hydrosphere.
- **The Globe Theater—**Using multiple, overlapping, computer-driven projectors, Rice Space Institute has created an "immersive" dome-shaped theater capable of showing Earth science-related productions using "SkyVision" projection technology from Sky-Skan of Nashua, New Hampshire.
- **Earth Forum—**This is a successful operational simulator and exhibit at the Houston Museum of Natural Science. In simulator mode, the Earth Forum is designed for 24–36 students working for 1.5–2.5 hours. Student teams are assigned to workstations representing the world's continents and resources. Using MuTPE databases, they evaluate the effects of an increasing global population on their continent and resources. Students play the roles of geographers, demographers, statisticians, and resource and political scientists.

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## Virginia Geospatial Extension Program

*http://www.cnr.vt.edu/gep*

The Virginia Geospatial Extension Program conducts targeted programs that promote the appropriate use of geospatial tools and applications, and integrate geospatial concepts throughout the K–20 educational pipeline. These tools and applications benefit our lives in many ways and include the global positioning system (GPS), geographic information systems (GIS) and using remote-sensing data

sources—satellite imagery and aerial photography—to provide innovative perspectives on local, regional, state and national issues. For example, GIS is to support urban planning, homeland security and to facilitate the management of environmental resources, including forests, wetlands, coastlands and endangered species.

The program is providing K–12 educational outreach in collaboration with the Virginia Space Grant Consortium's OVERspace program, specialized workforce courses and training through Virginia's Community College System and other VSGC member universities, faculty development, and linkages to NASA and other geospatial resources, data and programs. A key component of this program is its participation with Virginia extension agents, through Agriculture and Natural Resource programs and 4-H Youth Educational initiatives, to support the dissemination of information, training and application development at the grassroots level.

The program is sponsored by the VSGC and the Virginia Cooperative Extension, and is co-located at Virginia Tech in the College of Natural Resources and the College of Agriculture/Virginia Cooperative Extension.

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## Where on Earth...? MISR Mystery Image Quizzes

*http://www-misr.jpl.nasa.gov/education/whereonearth.html*

Embark on a geographical adventure with NASA's Multiangle Imaging SpectroRadiometer (MISR) Mystery Image Quizzes. These puzzles cover topics from archaeology to zoology and are designed to inspire understanding of the physical, biological and human processes that influence our home planet. Several resources for discovering and revealing the meaning of image features may help new geographical detectives to solve the challenging quiz questions.

A new mystery image and quiz appear approximately once every two months at the Web site listed above and at the MISR home page *(http://www-misr.jpl.nasa.gov).* Answers are published at the same locations. The names and hometowns of respondents who answer all questions correctly by the deadline will also be published in the order responses were received. The first three people on this list who are not affiliated with NASA, JPL or MISR, and who have not previously won a prize, will be sent a print of the image.

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